

Appl. No.: 10/664,517  
Arndt Dated: July 5, 2005  
Reply to Office Action of: April 5, 2005

### **REMARKS/ARGUMENTS**

#### **1. Claims and Restriction Requirement**

A Restriction Requirement identifying the following groups of claims as being drawn to potentially distinct inventions was made by the Examiner.

Group I. Claims 1 – 12, claims 7 – 12 drawn to an optical signal modulator, classified in class 359, subclass 247. claims 1 – 6 are being grouped with the modulator claims since these claims can be searched together with claims 7 – 12 without any undue burden on the Examiner; and

Group II. Claims 13 & 14, drawn to an optical waveguide, classified in class 385, subclass 129.

During a telephone conversation with the Examiner on March 28, 2005, applicants elected prosecution of the Group I claims 1-12. Applicants hereby confirm the election of claims 1-12. Claims 12 and 13 have been withdrawn from consideration with reservation of applicants' rights to file a divisional application.

Claims 1- 12 remain in this application. Claims 1 and 7 have been amended. Claims 13 & 14 have been withdrawn as a result of an earlier restriction requirement as described above.

The independent claims are claims 1 and 7. Claims 2-6 depend on claim 1, and claims 8-12 depend on claim 1.

Note:

#### **2. Claim Objections**

Claims 4, 5, 10 and 11 are objected to under 37 CFR 1.75 (c) as being in improper form because a multiple dependent claims can not depend from another multiple dependent claims.

Applicants traverse the rejection in view of the fact that a Preliminary Amendment was filed along with the application in which the multiple dependencies in the original claims were removed. The amended claims were filed as substitute pages.

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A copy of Applicants' postcard as mailed and as returned by the Patent Office is enclosed. The postcard indicates that the amendment was received by the Patent Office. In addition, for the Examiner reference, applicants have enclosed a copy of the Preliminary Amendment stamped "COPY". Unless amended herein, the claims filed as substitute pages in the Preliminary Amendment are listed on pages 2-4 of this paper as "original" claims.

Applicants respectfully submit that in view of the foregoing facts and Preliminary Amendment, the objection to claims 4, 5, 10 and 11 may properly be withdrawn.

Applicants also submit that since the failure to enter the Preliminary Amendment was due to a Patent Office error and applicants were not aware of the error until receipt of the Office Action of April 5, 2005, applicants rights to examination of claims 4, 5, 10 and 11, and any amendments made herein that involve such claims, should not be prejudiced.

### 3. Drawings

The Examiner has indicated in the accompanying form PTO-948 that the formal drawings previously submitted have been approved.

### 4. § 102 Rejections

The Examiner has rejected claims 1 - 3 and 7 - 9 under 35 U.S.C. § 102(e) as being anticipated by Mekis, et al (U.S. Patent No. 6,853,789) for the reasons set forth in Office Action. Applicants traverse the rejection. Claims 1 and 7 are the independent claims; claims 2-3 depend on claim 1 and claims 8-9 depend on claim 7.

With regard to claims 1 and 7, Mekis does not teach each and every element of claims 1 and 7, as amended, in that Mekis does not teach the application of an electric field to alter the transmission characteristics of the resonant cavity. Mekis teaches the use of gratings.

With regard to claims 2-3 and 8-9, applicants submit that Mekis for there being dependent on a non-anticipated claim. Specifically, Mekis does not anticipate these claims for failure to teach the use of an electric field to alter the transmission characteristics of the resonant cavity.

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Therefore, applicants respectfully submit that Mekis does not anticipate the claimed invention and that it is proper for the Examiner to withdraw the § 102(e) anticipation rejection.

### 5. § 103 Rejections

The Examiner has rejected claims 6 and 12 under 35 U.S.C. § 103(a) as being anticipated by Mekis, et al (U.S. Patent No. 6,853,789) in view of Blair et al (U.S. Patent No. 6,865,314) for reasons set forth in the Office Action. Applicants traverse the rejection.

As recognized by the Examiner in the Office Action, Mekis does not teach the use of an electric field to change the transmission characteristics of the resonant cavity. Mekis in fact uses a grating structure. Blair does not teach or suggest the use grating, and does not teach or suggest the use of a resonant cavity in the light path for an optical signal. Referring to Blair, column 2, lines 56 *et seq.*, Blair states that the resonant cavity lies on top of or beneath the input and output waveguides, an arrange which Blair states allow for more accurate control of the gap size and spacing. Blair further states in column 5, lines 12-18, that the resonant cavity 201 is separated from the input and output waveguides 202, 203 by a gap 206 made of a material 205.

Consequently, applicants submits that the combination of Mekis and Blair do not teach or suggest the claimed invention because Blair teaches away from the claimed invention by requiring that the resonant cavity be outside the optical light transmission path. In fact, in Blair the cavity is imposed above or below the waveguides. Further, by combining Mekis and Blair, applicants submit that one also must use a grating as required by Mekis as part of the resonant structure. This combination, regardless of whether or not Blair teaches the use of an electric field to alter transmission characteristics, does not result in applicants claimed invention. The combination of Blair and Mekis do not teach the claimed invention because the combination requires gratings and that the resonant cavity be outside the optical light path. There is no teaching or suggestion in the combination that grating need not be used (Mekis' requirement).

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Therefore, in view of the foregoing fact and arguments, applicants respectfully submit that claims 1 and 7, as amended, are patentable over the cited art, and that it is proper for the Examiner to withdraw the §103(a) rejection of claims 1 and 7. Applicants further submit that claims 2-6 and 8-12 are patentable for their dependence on a patentable base claims in view the fact that they further limit the base claim.

#### 5. Art Cited But Not Relied On

The Examiner has made of record, but not relied, on Fan et al (U.S. 6,512,866) and Miller et al (U.S. 6,859,304. Applicants submit that neither Fan nor Miller teach or suggest the claimed invention.

Applicants submit that Fan does not teach or suggest the claimed invention because Fan, as stated for example, in column 8, lines 28-34 and illustrated in Figure 10, requires two waveguides 902 and 904 lie above and below resonant cavity 906. See also Figure 4 and Column, line 51 *et seq.*

Applicants submit that Miller does not teach or suggest the claimed invention because Miller also requires the use of a photonic crystal having phase change material not present in the Applicants' invention. A phase change material, as contemplated by Miller is one that has the capability of reversibly transforming among crystalline, partially crystalline and amorphous states. See Miller, column 6, lines 24-58 and particularly lines 40-43.

#### 6. Conclusion

Based upon the above amendments, remarks, and papers of records, applicants believe the pending claims of the above-captioned application are in allowable form and patentable over the prior art of record. Applicants respectfully request that a timely Notice of Allowance be issued in this case.

Applicants believe that no extension of time is necessary to make this Reply timely. Should applicants be in error, applicants respectfully request that the Office grant such time extension pursuant to 37 C.F.R. § 1.136(a) as necessary to make this Reply timely, and hereby

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authorizes the Office to charge any necessary fee or surcharge with respect to said time extension to the deposit account of the undersigned firm of attorneys, Deposit Account 03-3325.

Please direct any questions or comments to Walter M. Douglas at (607) 974-2431.

5 July 2005  
Date

<p><b>CERTIFICATE OF TRANSMISSION</b> <b>UNDER 37 C.F.R. § 1.8</b></p> <p>I hereby certify that this paper and any papers referred to herein are being transmitted by facsimile to the U.S. Patent and Trademark Office at 703-872-9906 on:</p> <p><u>5 July 2005</u> Date</p> <p><u>Walter M. Douglas</u> Walter M. Douglas</p> <p><u>5 July 2005</u> Date</p>
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Respectfully submitted,  
CORNING INCORPORATED

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Postcard  
as  
mailed

Division S+T Date 9/17/03  
INVENTOR Pearson, et al  
CASE No. SP02-1916  
SERIAL No. \_\_\_\_\_  
FILED \_\_\_\_\_  
ATTORNEY Woo

The Patent and Trademark Office acknowledges and has stamped hereon the date of receipt of the items checked below:

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FORMAL/INFORMAL FIGURE NOS. 1-14  
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EXPRESS MAIL # EV 327189042 US  
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Division S+T Date 9/17/03  
INVENTOR Pearson, et al  
CASE No. SP02-1916 03137 U.S. PTO  
SERIAL No. 10/664517  
FILED \_\_\_\_\_  
ATTORNEY Woo

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JUL 05 2005

PATENT  
CASE NAME/NO. SP02-196

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor: Thomas P. Pearsall and  
Alexei V. Tchelnokov  
Serial No: TBD  
Filing Date: TBD  
Title: HIGH SPEED OPTICAL  
MODULATOR

Group Art Unit: TBD

Examiner: TBD

AMENDMENT ACCOMPANYING  
APPLICATION

COPY

Box Patent Application  
Assistant Commissioner for Patents  
Alexandria, VA 22313-1450

## AMENDMENT ACCOMPANYING PATENT APPLICATION

Sir:

Prior to calculating the fees due in the application, please enter the following amendments to the claims. Substitute pages 15-16 are enclosed.

The purpose of this amendment is to remove the multiple dependent claims that were present in the priority European application.

In The Claims:

Replace pages 15-16 having claims 1-14 with substitute pages 15-16 having amended claims 1-14.

## Remarks

The claims have been amended to remove the multiple dependencies. The case was first filed in Europe as stated and claimed in Paragraph [0001].

Please direct any questions or comments to Dr. Walter M. Douglas at (607) 974-2431.

Date: 17 September 2003Date of Deposit: 17 September 2003

I hereby certify that this paper or fee is being deposited with the United States Postal Service as Express Mail to Addressee service under 37 CFR 1.8 on the date indicated above and is Addressed to the Commissioner of Patents and Trademarks, Alexandria, VA 22313-1450

Signature: Walter M. Douglas

Walter M. Douglas

Date: 17 September 2003

Express Mail No. EV 327189042 US

Respectfully submitted,



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Substitute pages

SP02-196

CLAIMS**COPY**

1. A method of modulating an optical signal comprises the steps of:  
providing a waveguide defining a light path for said optical signal;  
providing a resonant cavity in said light path; and  
altering the transmission characteristic of the resonant cavity whereby to control the degree of transmission of light of a selected frequency propagating in said light path.
2. The modulation method of claim 1, wherein the waveguide-providing step comprises providing a waveguide selected in the group consisting of photonic crystal waveguides, total internal reflection waveguides, and waveguides combining the principles of photonic crystal waveguides and total internal reflection waveguides.
3. The modulation method of claim 1, wherein the resonant-cavity-providing step comprises providing a plurality of holes defining a photonic bandgap device in the waveguide.
4. The modulation method of claim 1, wherein the waveguide-providing step comprises providing a waveguide having a silicon (Si) core layer clad with silica (SiO<sub>2</sub>).
5. The modulation method of claim 4, wherein the transmission-characteristic-altering step comprises the step of applying an electric field to the resonant cavity whereby to cause the MOS effect and alter the Q-factor of the cavity.
6. The modulation method of claim 1, further comprising the step of providing a p-n junction in the waveguide at the resonant cavity, wherein the transmission-characteristic-altering step comprises the step of applying a biasing electric field to the p-n junction whereby to alter the Q-factor of the cavity.
7. An optical signal modulator, comprising:  
a waveguide defining a light path for an optical signal;  
a resonant cavity in said light path; and

Substitute pages

SP02-196

a control unit for altering the transmission characteristic of the resonant cavity whereby to control the degree of transmission of light of a selected frequency propagating in said light path.

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8. The optical signal modulator of claim 7, wherein the waveguide is selected in the group consisting of photonic crystal waveguides, total internal reflection waveguides, and waveguides combining the principles of photonic crystal waveguides and total internal reflection waveguides.
9. The optical signal modulator of claim 7, wherein the resonant cavity comprises a plurality of holes defining a photonic bandgap device in the waveguide.
10. The optical signal modulator of claim 7, wherein the waveguide has a silicon (Si) core layer clad with silica (SiO<sub>2</sub>).
11. The optical signal modulator of claim 10, wherein the control unit is adapted, in use, to apply an electric field to the resonant cavity whereby to cause the MOS effect and alter the Q-factor of the cavity.
12. The optical signal modulator of claim 7, and comprising a p-n junction provided in the waveguide at the resonant cavity, wherein the control means is adapted, in use, to apply a biasing electric field to the p-n junction whereby to alter the Q-factor of the cavity.
13. A planar silicon waveguide defining a light path, the waveguide having a resonant cavity formed in the light path.
14. The planar silicon waveguide of claim 13, wherein the resonant cavity is constituted by a photonic bandgap device.